NATIONAL TALENT SEARCH EXAMINATION, 2015-16 (STATE LEVEL) (FOR STUDENTS STUDYING IN CLASS X) SATQUESTION

Time: 1 Hrs.

Full Marks: 100

INSTRUCTIONS TO CANDIDATES

	Read the instructions carefully before you start answering the questions. Answers are to be given on a OMR Answer- Sheet provided.
1.	In this Paper you are to answer 100 questions. Each questions carries 1 (one) mark. You are to answer all the questions.
2.	Before you proceed to mark in the OMR answer-Sheet, find out the correct answer from the four alternatives (a), (b), (c) and (d) against each question in the Question Booklet. Darken the circle with a Black Ball Point Pen, to the corresponding correct answer for the item in the OMR Answer-Sheet. (Here 'b' is the correct answer.)
3.	If more than one circle is encoded or darken against a particular answer, it will be treated as a wrong answer.
4.	There will be no penalty marks or negative marking for a wrong answer.
5.	You are to start recording answers with the 'start' instruction from the Officer-in-Charge of your room/hall.
6.	You are to write your Name and Roll No. in the space provided with for this purpose on the OMR Answer-Sheet. You must encode your Roll No. in OMR Answer Sheet.
7.	The OMR Answer-Sheet should be handed over to the Invigilator before leaving the Examination Hall. You may take away the used Question Booklet after completion of the examination.

Enrollment No. :	Batch :
Name :	
Candidate's Signature	_ Invigilator's Signature:

MATHEMATICS

1.	If $f\left(2x+\frac{1}{x}\right) = x^2 + \frac{1}{4x^2} + 1(x \neq 0)$, the value of $f(x)$ is						
	(a) $4x^2$	(b) $\frac{1}{4}\left(2x+\frac{1}{x}\right)^2$	(c) $\frac{1}{4}x^2$	(d) $4\left(2x+\frac{1}{x}\right)^2$			
2.	If $x - 2\sqrt{x} = 3$, then the (a) 1	value of x is (b) 3	(c) 9	(d) – 1			
3.	The value of $\sqrt{5-2\sqrt{6}}$ (a) $\pm (\sqrt{3}-\sqrt{2})$	is (b) $\sqrt{3} - \sqrt{2}$	(c) $\sqrt{2} - \sqrt{3}$	(d) All of the above			
4.	If $x=ay, y=bx$, the value	ue of $\frac{1}{a+1} + \frac{1}{1+b}$ is					
	(a) 0	(b) x + y	(c) $\frac{1}{x+y}$	(d) 1			
5.	The least value of $2x^2$. (a) 3	$-4x+3y^2-18y+31$ is (b) -1	(c) 0	(d) 2			
6.	If $2r = h + \sqrt{r^2 + h^2}$, the (a) 4 : 3	e value of r : h is $(r, h \neq 0)$ (b) 3 : 4) (c) 1 : 2	(d) 2 : 1			
7.	If $x = cy + bz$, $y = cx + (a) abc$	az, $z = bx + ay$, the valu (b) $- abc$	e of $a^2 + b^2 + c^2 - 1$ is (c) 2abc	(c) – 2abc			
8.	If $x(x^3 - 1) < 0$, then (a) $x < 0$	(b) 0 < x < 1	(c) x > 1	(d) None of the above			
9.	Among the numbers 2^{2} (a) 2^{250}	⁵⁰ , 3^{200} , 4^{150} and 5^{100} , the (b) 3^{200}	greatest is (c) 4 ¹⁵⁰	(d) 5^{100}			
10.	If $a*b = a + b - ab$, the (a) 20	value of 4 * 5 + 5 * 6 is (b) - 20	(c) 30	(d) – 30			
11.	When the rate of inte	rest being increased fro	m 10% to $12\frac{1}{2}$ %, the	yearly income of a person			
	increases by Rs. 1,250. (a) Rs. 50,000	The principal amount was (b) Rs. 5,000	as (c) Rs. 15,000	(d) 37,500			
12.	A man sells two article on the other. Net profit	es each at Rs. 198. He ma or loss of the person	akes a profit of 10% on a	one article and a loss of 10%			
13	(a) 2% prom The price of a house is	(0) 2% 1088 Rs 6 76 000 If the price	(C) 1% prom	(d) 1% 1088			
10.	the price of the house w (a) Rs. 6,00,000	vas (b) Rs. 6,25,000	(c) Rs. 6,50,000	(d) Rs. 5,75,000			
14.	'O' is any point inside (a) $OP^2 + OR^2 = OQ^2 +$ (c) $OP^2 + OS^2 = OQ^2 +$	the rectangle PQRS, then OS^2 QR ²	(b) $OP^2 + OQ^2 = OR^2 +$ (d) None of the above	OS^2			

- 15. The vertical angles of two isosceles triangles are equal. If the ratio of the areas is 9 : 16, the ratio of the heights of the triangle is
 (a) 9 : 16
 (b) 16 : 9
 (c) 3 : 4
 (d) 4 : 3
- 16. If the edge of a regular tetrahedron is 1 cm, then its volume is $\sqrt{2}$

(a)
$$\frac{1}{12}$$
 cm³ (b) $\frac{\sqrt{2}}{6}$ cm³ (c) $\frac{\sqrt{2}}{12}$ cm³ (d) $\frac{\sqrt{2}}{4}$ cm³

- 17. The length, breadth and height of a solid rectangular parallelepiped made of copper are 11 cm, 9 cm and 6 cm respectively. How many coins of radius 1.5 cm having thickness 0.25 cm can be produced by melting it?
 (a) 168
 (b) 170
 (c) 336
 (d) 340
- 18. If $\sin^2 A + \sin^4 A = 1$, the value of $\tan^2 A \tan^4 A$ is (a) -1 (b) 1 (c) 0 (d) 2
- 19. The least value of $2^{\sin^2 x} + 2^{\cos^2 x}$ is (a) 4 (b) $2\sqrt{2}$ (c) 2 (d) $\sqrt{2}$
- 20. If ABCD is a cyclic quadrilateral, the value of $\tan \frac{A}{2} \tan \frac{C}{2} + \tan \frac{B}{2} \tan \frac{D}{2}$ is (a) 0 (b) 1 (c) -1 (d) 2

PHYSICS

- 21. The linear momentum 'p' of a body having mass 'm' and kinetic energy 'E' is (a) $p=\sqrt{2mE}$ (b) $p=\sqrt{E/2m}$ (c) $p=\sqrt{2m/E}$ (d) $p=\sqrt{mE}$
- 22. In the adjacent V T diagram what is the relation between pressures P_1 and P_2 ?

(a) $P_2 = P_1$ (b) $P_2 > P_1$ (c) $P_2 < P_1$ (d) Cannot be predicted

- 23. A musical instrument has tones of frequencies 256 Hz, 502 Hz, 1020 Hz and 1280 Hz. The frequencies of the fundamental and its harmonic are given by
 (a) 256 Hz and 502 Hz respectively
 (b) 256 Hz and 1020 Hz respectively
 (c) 502 Hz and 1020 Hz respectively
 (d) 256 Hz and 1280 Hz respectively
- 24. The total energy of a particle executing Simple Harmonic Motion of amplitude 'A' is proportional to (a) A^2 (b) A^{-2} (c) A (d) 1/A
- 25. Refractive index of a medium with respect to air is $\mu = \sqrt{2}$, find the critical angle between the two medium (a) 30° (b) 90° (c) 45° (d) 60°
- 26. What will be the colour of the sky as seen from the earth if there is no atmosphere? (a) Black (b) Blue (c) Orange (d) Red
- 27. A convex lens of glass has power P in air. If it is immersed in water, its power will be(a) more than P(b) less than P
 - (b) less u
 - (c) P
 - (d) More the P for some colours and less than P for others

28. Two electrodes are maintained at a potential difference of 100 V. An electron moving from cathode to anode gains kinetic energy (c) 160×10^{-19} Joule (a) 160×10^{-19} Erg (b) 100 Joule (d) 100 Erg 29. In a transformer, the number of turns in the primary is 4 A then the current in the secondary is (a) 4 A (b) 2 A (c) 6 A (d) 10 A 30. What is the equivalent resistance between any two vertex of a triangle if the sides of the triangle are of equal resistance? (a) 3R (b) 2R (c) R (d) 2R/331. Fill in the gap $_{12}$ Mg²⁵+ $_{1}$ H¹ \rightarrow_{11} Na²²+____ (b) $_{2}\text{He}^{4}$ (c) ${}_{1}H^{3}$ (a) $_{1}H^{1}$ (d) ${}_{1}H^{2}$ 32. Gamma ray is highly energetic (a) Electron (b) Proton (c) Electromagnetic wave (d) Neutron 33. The radius of the nucleus of an atom of mass number A is proportional to (d) $A^{5/3}$ (a) $A^{3/4}$ (b) $A^{2/3}$ (c) $A^{1/3}$ **CHEMISTRY** 34. The number of atoms in 0.1 mole of a triatomic gas is (d) 1.8×10^{22} (a) 6.026×10^{22} (b) 1.806×10^{23} (c) 3.6×10^{23} 35. An ion with mass number 56 contains 3 units of positive charge and 30.4% more neutrons than electrons. Atomic number of the element is (a) 24 (b) 25 (c) 26 (d) 27. Which of the following orders of ionic radii is correctly represented? 36. (b) $Na^+ > F^- > O^{2-}$ (c) $F^- > Na^+ > O^{2-}$ (a) $H^- > H^+ > H$ (D) $H^- > H > H^+$ 37. In the structure of Napthalene the difference between the number of sigma bonds and the number of pi bond is (a) 6 (b) 7 (c) 12 (d) 14. x mole of oxygen gas is kept in a container of definite volume at a pressure of P atmosphere at TK. 38. At the same temperature another y mole of oxygen gas introduced in that container. The total pressure will be (b) $\frac{xP}{x+y}$ (c) $\frac{yP}{x+y}$ (d) $\left(\frac{x+y}{x}\right)P$. (a) x(1 + y)P39. 0.25 mole of a hydrocarbon requires 0.5 mole of hydrogen for complete saturation. Possible formula of the hydrocarbon is $(C) C_4 H_8$ (a) $C_{3}H_{8}$ (b) $C_{3}H_{6}$ (d) $C_{3}H_{4}$. 40. Which of the following pair of compounds represent functional group isomerism? (a) Diethyl ether and ethanol (b) dimethyl ether and ethanol (c) Acetadehyde and Propanal (d) Isobutane and Butane. Extraction of highly electropositive metal is done by 41. (a) Electrolysis of aqueous solution of metal chloride (b) Electrolysisi of molten metal chloride. (c) Carbon reduction of the oxide of the metal (d) Strongly heating the oxide of the metal. 42. Which one is a Redox reaction? (a) $HCl + AgNO_3 = AgCl + HNO_3$ (b) NaBr + HCl = NaCl + HBr(c) $Na_2O + H_2SO_4 = Na_2SO_4 + H_2O$ (d) $H_2 + Br_2 = 2HBr$.

- 43. Some amount of air is kept in an open container at 27°C. At what temperature the container should be heated in order to eliminate ³/₈*th* part of the air from the container?
 (a) 307°C
 (b) 207°C
 (c) 107°C
 (d) 100°C.
 44. What is the pH of 0.005 (M) H₂SO₄ solution?
 (a) 3
 (b) 4
 (c) 2
 (d) 5.
 - (a) $(x^2 p^2)(y^2 q^2) = 0$ (b) $(x^2 + p^2)(y^2 + q^2) = 0$ (c) $(x^2 - q^2)(y^2 - p^2) = 0$ (d) $(x^2 + q^2)(y^2 + p^2) = 0.$
- 46. A mixture of CH₄, C₂H₄ and C₂H₂ is passed through a basic copper (I) chloride solution. Which gas/gases will come out?
 (a) Whole mixture
 (b) CH₄ and C₂H₂
 (c) CH₄ and C₂H₄
 (d) C₂H₄.
- 47. In Mandelian monohybrid cross how many offsprings of recessive character will appear in F₂ generation out ot total progeny?

BIOLOGY

(a)
$$\frac{1}{2}$$
 (b) $\frac{3}{4}$ (c) $\frac{1}{4}$ (d) $\frac{1}{3}$.

48. Various trophic levels of an ecological pyramid given below have been indicated as T_1 , T_2 , T_3 and T_4 . In which trophic level maximum energy will be available?

(a)
$$T_4$$
 (b) T_3 (c) T_2 (d) T_1 .

49.	How many carbon is pr	esent in Acetyl COA?					
(a) Four (b) One		(b) One	(c) Three	(d) Two.			
50	Antibodies are complex	·					
50.	(a) Lipoproteins	(b) Steroids	(c) Prostaglandins	(d) Globulin Proteins.			
51.	Podocyte cell is found i	n human					
	(a) Glomerulus	(b) Bowman's Capsule	(c) Cerebrum	(d) Cerebellum.			
~-							
52.	The simplest amino acid	d is	() O1				
	(a) Lysine	(b) Leucine	(c) Glycine	(d) Methionine			
53	Gastric juice contains						
55.	(a) Pepsin and trypsin	(b) Pepsin and HCl	(c) Trypsin and HCl	(d) Amylase and Pepsin.			
54.	Maximum amount of water from glomerular filtrate is reabsorbed in						
	(a) Proximal Convolute	d Tubule	(b) Distal Convoluted Tubule				
	(c) Descending limb of	Henle's loop	(d) Ascending limb of Henle's loop.				
55	What will be non if die	mater of enterry is reduced	49				
55.	(a) Blood pressure will	fall	(b) Blood pressure will increase				
	(c) Blood pressure will	remain same	(d) Blood will coagulat	e			
	(c) Diood probbuic will	i cinani sanc	(a) brood will congulate.				

56.	Which one of the follow (a) Mushroom, Yeast, I (c) Paramoceium, Eugl	wing is the correct set of Riccia- Fungi ia, Obellia- Protista	examples of a particular group? (b) Starfish, Catfish, Dogfish- Pisces (d) Whale, Frog, Bat- Craniata.				
57.	Whose functions are sa (a) Stomata and Veins (c) Lenticels and Paren	me of the following? chyma	(b) Stomata and Lenticels(d) Hydathodes and Seive Tube.				
58.	Find the odd man out (a) Gonadotrophins	(b) Thyrotrophins	(c) Corticotrophins (d) Vasopressin.				
59.	 Which one of the following is a character of self-pollinated flower? (a) Flowers are large and showy. (b) Petals remain closed and do not open (c) Stigma and another mature at different time. (d) Poilens are produced in a very large quantities. 						
60.	The chief excretory sub (a) Ammonia	ostance of vegetarian peo (b) Urea	ple is (c) Uric Acid	(d) Lactic Acid.			
		HIS	TORY				
61.	Who wrote 'The Spirit (a) Adam Smith	of Laws'? (b) Rousseau	(c) Montesquieu	(d) Voltaire.			
62.	The treaty of Tilsit (18) (a) France and Russia	07) was signed between(b) France and Prussia	(c) France and England (d) France and Austr				
63.	Who became the king a (a) Louis Napolean	after the July Revolution (b) Louis Philippe	of 1830? (c) Louis Blanc (d) Louis XVIII.				
64.	Who was called 'Czar t (a) Nicholas I	the Liberator" (b) Nicholas II	(c) Alexander I	(d) Alexander II			
65.	5. By which treaty Clive secured the Diwani of Bengal, Bihar and Orissa?(a) Treaty of Allahabad (b) Treaty of Alinagar (c) Treaty of Bassein (d) Treaty of Bengal						
66.	The first Peshwa of the (a) Balaji Biswanath	Marathas was (b) Balaji Baji Rao	(c) Baji Rao I (d) Madhab Rao.				
67.	Calcutta Medical Colle (a) David Hare	ge was founded by (b) Lord Hardinge	(c) Sir Charles Wood	(d) Lord William Bentick.			
68.	The founder of Dawn S (a) Sachindra Prasad B	Society was asu	(b) Satish Chandra Muk	therjee			
69.	(c) Aurobindo GhoshWho was knows as 'Lc(a) Bal Gangadhar Tila(c) Gopal Hari Deshmu	okahitobadi'? k Ikh	(b) Gopal Krishna Gokhale(d) Gopal Ganesh Agarkar.				
70.	The Congress declared (a) 1927 AD	demand for complete ind (b) 1907 AD	dependence in the year (c) 1929 AD	(d) 1950 AD.			
71.	The Zollverein of Gern (a) Teachers' Union	nany was (b) Tariff Union	(c) Student's Union	(d) Revenue Union.			

72.	Who wrote 'Mein Kam (a) Hitler	pf"? (b) Gottfried Fieder	(c) Fredrick Ebert	(d) Hindenburg.			
73.	The Capital of India wa (a) Lord Curzon	as shifted from Calcutta t (b) Lord Minto	o Delhi during the reign (c) Lord Hardinge	of (d) Lord Chelmsford.			
74.	Who was the Viceroy o (a) Lord Curzon	f India at the time of Jall (b) Lord Minto	ianwala Bagh massacres (c) Lord Bentinck	(d) Lord Chelmsford.			
75.	Who was elected the fin (a) Dr. B. R. Ambedkar (a) Mahatma Gandhi	est chairman of the Const	ituent Assembly? (b) Dr. Rajendra Prasad (d) Jawaharlal Nehru.				
		GEOG	GRAPHY				
76.	The Sun looks the smal (a) 3 rd January	lest from the earth on (b) 21 st June	(c) 4 th July	(d) 22 nd December.			
77.	Among the Geomorphic (a) Constructive proces (c) Destructive process	c processes, denudation i s	is a (b) Gradational process (d) Endogenous process.				
78.	 In the equatorial region due to high temperature and humidity (a) Mechanical weathering is predominant (b) Chemical weathering is predominant (c) Both mechanical and chemical weathering are predominant (d) Organic weathering is predominant. 						
79.	 'Out wash plain' are formed by (a) Glacial abrasion (b) Glacial deposition (c) Glacial plucking (d) None of the above 						
80. I stay over the equatorial region. Due to high temperature continuous ascent of air is commo							
	horizontal flow of air is (a) Doldrums	found. Who am I? (b) Hore latidue	(c) Geostrophic wind	(d) Coriolis force.			
81.	Hurricane is one type o (a) Easterly wave	f (b) Temperate cyclone	(c) Anti cyclone	(d) Tropical cyclone.			
82.	Somali Current flows a (a) Africa	long the coast of (b) Oceania	(c) North America	(d) Europe.			
83.	The highest plateau of l (a) Deccan Plateau	India is (b) Pat region	(c) Ladakh plateau	(d) Meghalalya plateau.			
84.	Pulm, Palas, Sirish etc. (a) Himalayan Mountai (c) Wet deciduous fores	are important trees of nous forest st	(b) Dry deciduous forest (d) Evergreen forest.				
85.	Rainbow revolution relation (a) New Agricultural Po (c) Artificial Rain	ated to plicy	(b) Egg Production(d) Non-conventional energy.				
86.	Alluminium is produced (a) Biotite	d from (b) Magnetite	(c) Bauxite	(d) Anthracite.			
87.	Which industry is called (a) Automobile Industry (c) Cotton Textile Indust	d the 'Sunrise Industry'? y stry	(b) Jute Industry(d) Petro-Chemical Ind	ustry.			

88.	The population sex ratio is lower in which state / union territory as per 2011 census(a) Hariyana(b) Daman(c) Kerala(d) West Bengal.						
89.	Vitim and Aldin are two principal tributaries of (a) Ob (b) Yenisey	the river (c) Lena	(d) Amur.				
90.	In west Bengal the river which makes a bo Bardhman. (a) Ajay (b) Damodar	oundary between the tv (c) Mayurakshi	wo districts of Birbum and (d) Kangsabati.				
91.	POLITICAL SCIENCEThe words 'Socialist' and 'Secular' were added to the Preamble of the Constitution of India by the(a) Original Text of the Indian Constitution(b) 42^{nd} Constitutional Amendment Act(c) 44^{th} Constitutional Amendment Act(d) 93^{rd} Constitutional Amendment Act.						
92.	How many members in the Rajya Sabha can be (a) 2 (b) 4	nominated by the Presid (c) 6	lent of India? (d) 12.				
93.	The 'Social Contract' was written by (a) Aristotle (b) Machiavelli	(c) Plato	(d) Rousseau.				
94.	The headquarter of the International Court of Ju(a) New York(b) Paris	stice is (c) Heague	(d) London.				
95.	The declaration of 'South Asian Association for (a) 1983, 8 th December (c) 1981, 8 th December	Regional Co-operation ³ (b) 1985, 8 th December (d) 2007, 8 th December	egional Co-operation' (SAARC) was signed on b) 1985, 8 th December d) 2007, 8 th December.				
96.	 Economics 96. Excess supply of money will not create inflationary pressure if, in the country, (a) demand for different good and services increase. (b) productivity increases. (c) rate of tax decreases. (d) rate of interest decreases. 						
97.	 Which one of the following costs has to be incurred even if production remains closed for a temporary period? (a) Electricity charges (b) Transportation costs (c) Rent for factory building (d) Expenditure on raw materials. 						
98.	The three basic problems of an economic system arise from (a) inequality of income (c) failure of planning (d) scarcity of resources.						
99.	Which one of the following is not a source of go (a) Grant-in-aid (b) Public debt	overnment revenue? (c) Stamp duty	(d) Income tax.				
100.	Which of the following institutions is the Centra (a) State Bank of India (c) Central Bank of India	l Bank of India? (b) Indian Bank (d) Reserve Bank of In	dia.				

NATIONAL TALENT SEARCH EXAMINATION, 2015 - 16 (STATE LEVEL) (FOR STUDENTS STUDYING IN CLASS X) SAT – ANSWER KEY

1	С	11	А	21	Α	31	В	41	В
2	С	12	D	22	С	32	С	42	D
3	В	13	В	23	D	33	С	43	В
4	D	14	А	24	Α	34	В	44	С
5	D	15	С	25	С	35	С	45	Α
6	Α	16	С	26	Α	36	D	46	С
7	D	17	С	27	В	37	D	47	С
8	В	18	Α	28	С	38	D	48	D
9	В	19	В	29	В	39	D	49	D
10	D	20	D	30	D	40	В	50	D
51	В	61	С	71	В	81	D	91	В
52	С	62	A/B	72	Α	82	Α	92	D
53	В	63	В	73	С	83	С	93	D
54	Α	64	D	74	D	84	В	94	С
55	В	65	Α	75	В	85	Α	95	В
56	D	66	С	76	D	86	С	96	В
57	В	67	D	77	В	87	Α	97	С
58	D	68	В	78	В	88	Α	98	D
59	В	69	С	79	В	89	С	99	Α
60	В	70	С	80	Α	90	Α	100	D

NATIONAL TALENT SEARCH EXAMINATION, 2015-16 (STATE LEVEL) (FOR STUDENTS STUDYING IN CLASS X) SAT-SOLUTION

MATHEMATICS

1. Sol. $f\left(2x+\frac{1}{x}\right)=\frac{1}{4}\left(4x^{2}+\frac{1}{x^{2}}\right)+1$ $=\frac{1}{4}\left|\left(2x+\frac{1}{x}\right)^2-4\right|+1$ $=\frac{1}{4}\left[\left(2x+\frac{1}{x}\right)^{2}\right]$ $f(x) = \frac{1}{4}(x^2)$ 2. Sol. $x-2\sqrt{x}=3$ $x-2\sqrt{x}-3=0$ $\left(\sqrt{x}-3\right)\left(\sqrt{x}+1\right)=0$ $\sqrt{x} = 3, \qquad \qquad \left[\because \sqrt{x} \neq -1 \right]$ $\Rightarrow x = 9$ 3. Sol. $\sqrt{5-2\sqrt{6}}$ $-\sqrt{(\sqrt{3})^2 + (\sqrt{2})^2 - 2\sqrt{6}}$ $=\sqrt{3}-\sqrt{2}$ 4. **Sol.** $a = \frac{x}{y}$ $b = \frac{y}{x}$ $a+1=\frac{x+y}{v}$ $b+1=\frac{x+y}{x}$ $\frac{1}{a+1} + \frac{1}{1+b} = 1$ 5. Sol. $2(x^2-2x+1-1)+3(y^2-6y+9-9)+31$ $=2(x-1)^{2}-2+3(y-3)^{2}-27+31$ Least value = 2

- 2 -

6. Sol. $(2r-h)^2 = r^2 + h^2$ $4r^2 - 4rh = r^2$ $3r^2 = 4rh$ $\frac{r}{h}=4:3$ 7. Sol. y = c (cy + bz) + az $(1 - c^2)y = (bc + a) z \dots (1)$ Z = b(cy + bz) + ay $(1 - b^2) z = (bc + a) y \dots (2)$ $\frac{1-c^2}{bc+a} = \frac{bc+a}{1-b^2}$ $1-b^2-c^2+b^2c^2=b^2c^2+abc+abc+a^2$ $a^{2}+b^{2}+c^{2}-1=-2abc$ 8. Sol. $x(x^3-1) < 0$ $x(x-1)(x^2 + x + 1) < 0$ $x^{2} + x + 1 > 0$ because discriminant is – ve $x(x-1) < 0 \implies 0 < x < 1$ 9. Sol. $2^{250} 3^{200} 4^{150} 5^{100}$ $= (2^5)^{50} (3^4)^{50} (4^3)^{50} (5^2)^{50}$ $=(32)^{50}(81)^{50}(64)^{50}(25)^{50}$ 10. **Sol.** 4 *5 + 5 * 6 $= (4 + 5 - 4 \times 5) + (5 + 6 - 5 \times 6)$ = - 30 11. Sol. Let principal amount is A. then $\frac{A \times \frac{25}{2} \times 1}{100} - \frac{A \times 10 \times 1}{100} = 1250 \Longrightarrow A = 50,000$ 12. Sol. Net cost price $=\frac{198}{1+\frac{10}{100}}+\frac{198}{1-\frac{10}{100}}$ $=198\left(\frac{10}{11}+\frac{10}{9}\right)=400$ Selling price $=2 \times 198 = 396$ loss = 400 - 396 = 4 $\% \text{ loss} = \frac{4}{400} \times 100 = 1$ 13. Sol.

Let the price two years before be P.

So, current price will be $P \times \left(1 + \frac{4}{100}\right)^2$

:.
$$P \times \left(1 \times \frac{4}{100}\right)^2 = 6,76,000$$

14. Sol. $OP^2 = x^2 + y^2$ $OR^2 = (x - a)^2 + (y - b)^2$ $OQ^2 = (x - a)^2 + y^2$ $OS^2 = x^2 + (y - b)^2$ $\therefore OP^2 + OR^2 = OQ^2 + OS^2$





So, both the triangles are similar and in case of similar triangles, area of triangles are in ratio of square of their heights

$$\therefore \frac{\mathbf{h}_1^2}{\mathbf{h}_2^2} = \frac{9}{16} \Longrightarrow \frac{\mathbf{h}_1}{\mathbf{h}_2} = \frac{3}{4}$$

16. Sol.

Volume of tetrahedron = $\frac{a^3}{6\sqrt{2}}$ where

 $a \rightarrow length of edge$

17. Sol.

Volume of parallelopide = Number of coins × Volume of single coin $\Rightarrow 11 \times 9 \times 6 = n \times \pi \times 1.5^2 \times 0.25$

18. Sol.

$$\sin^{4} A = \cos^{2} A$$

$$\tan^{2} A - \tan^{4} A$$

$$= \frac{\sin^{2} A}{\cos^{2} A} - \frac{\sin^{4} A}{\cos^{4} A}$$

$$= \frac{\sin^{2} A}{\sin^{4} A} - \frac{\cos^{2} A}{\cos^{4} A}$$

$$= \cos \sec^{2} A - \sec^{2} A$$

$$\frac{\cos^{2} A - \sin^{2} A}{\sin^{2} A \cos^{2} A}$$

$$= \frac{\sin^{4} A - \sin^{2} A}{\sin^{2} A \cos^{2} A} = \frac{-\sin^{2} A \cos^{2} A}{\sin^{2} A \cos^{2} A}$$

$$= -1$$

19. **Sol.**

 $2^{\sin^2 x} + 2^{\cos^2 x}$

$$= 2^{\sin^2 x} + \frac{2}{2^{\sin^2 x}}$$

Applying $A.M \ge G.M$

 $S(o,b) \xrightarrow{\bullet} P(o,o) \xrightarrow{\bullet} P(a,b)$

20.

21.

$$\frac{2^{\sin^2 x} + \frac{2}{2^{\sin^2 x}}}{2} \ge \sqrt{2^{\sin^2 x} \cdot \frac{2}{2^{\sin^2 x}}}$$

$$2^{\sin^2 x} + 2^{\cos^2 x} \ge 2\sqrt{2}$$
Least value = $2\sqrt{2}$
Sol.
A+C= π
B+D= π
L.H.S = $\tan \frac{A}{2} \tan \frac{C}{2} + \tan \frac{B}{2} \tan \frac{D}{2}$
 $\tan \left(\frac{\pi}{2} - \frac{C}{2}\right) \tan \frac{C}{2} + \tan \left(\frac{\pi}{2} - \frac{D}{2}\right) \tan \frac{D}{2}$
= C+ $\frac{C}{2} \tan \frac{C}{2} + C + \frac{D}{2} \tan \frac{D}{2}$
= 2

PHYSICS

$$E = \frac{1}{2}mv^{2}$$
$$\Rightarrow E = \frac{1}{2}\frac{P^{2}}{m}$$
$$P = \sqrt{2mE}$$
22. Sol.
$$\therefore Pv = nRT$$
$$v = \frac{nR}{P}T$$
$$\frac{nR}{P} = \tan \theta$$

Sol.

$$\frac{nR}{P} = \tan \theta$$
$$\tan \theta \propto \frac{1}{P}$$
$$\theta_2 > \theta_1$$
$$\tan \theta_2 > \tan \theta_1$$
$$\therefore P_1 > P_2$$



23. Sol.

Harmonics are multiple of fundamental frequencies.

24. Sol.

$$E = \frac{1}{2} k A^{2}$$
$$E \propto A^{2}$$

25. Sol.

 $Sinc = \frac{1}{\mu}$ $C = 45^{\circ}$

26. **Sol.**

In the absence of atmosphere, no scattering of light.

27. Sol.

$$\frac{1}{f} \propto \left(\frac{\mu_{\text{lens}}}{\mu_{\text{medium}}} - 1\right) K$$
Sol.

28. Sol.

$$E = ev$$

 $= 100 \times 1.6 \times 10^{-19} J$

29. Sol.

$$I_2 = \frac{140}{280} \times I_1$$

= $\frac{4}{2} = 2A$

30. Sol.

$$R = \frac{2R \times R}{2R + R}$$
$$= \frac{2R}{3}$$

31. Sol.

32.

- By balancing mass number and atomic number $_2\text{He}^4$ Sol.
- Gamma ray lies in the electro magnetic spectrum.
- 33. **Sol.**

 $\mathbf{R} \propto \mathbf{A}^{\frac{1}{3}}$

CHEMISTRY

- 34. No of molecules in 0.1 mol = $6.023 \times 10^{23} \times 0.1$ No of atoms for a triatomic gas = $6.023 \times 10^{23} \times 0.1 \times 3$ = 1.806×10^{23}
- 35. No of protons = 26No of neutrons = 30No of electrons = 23Ion is Fe⁺³
- 36. Anionic radius > Covalent radius & Covalent radius > Cationic radius.

No of σ bonds = 19 No of π bonds = 5

- 38. At const V & T $P \propto n$
- 40. Alcohols and ethers are functional isomers.
- 41. Refer Text

- 42. H_2 is getting oxidised and Br_2 is getting reduced.
- 43. At const. P & V, $n \propto \frac{1}{T}$
- $\begin{array}{ll} \mbox{44.} & [H^+] \mbox{ in } 0.005 \mbox{ M } H_2 SO_4 \mbox{ solution} = 2 \times 0.005 = 0.01 \\ & \mbox{ Therefore } pH = 2 \end{array}$
- 45. y = q
- 46. C_2H_2 is absorbed in basic copper (I) chloride solution.